TRANSPORTATION AND CLIMATE CHANGE

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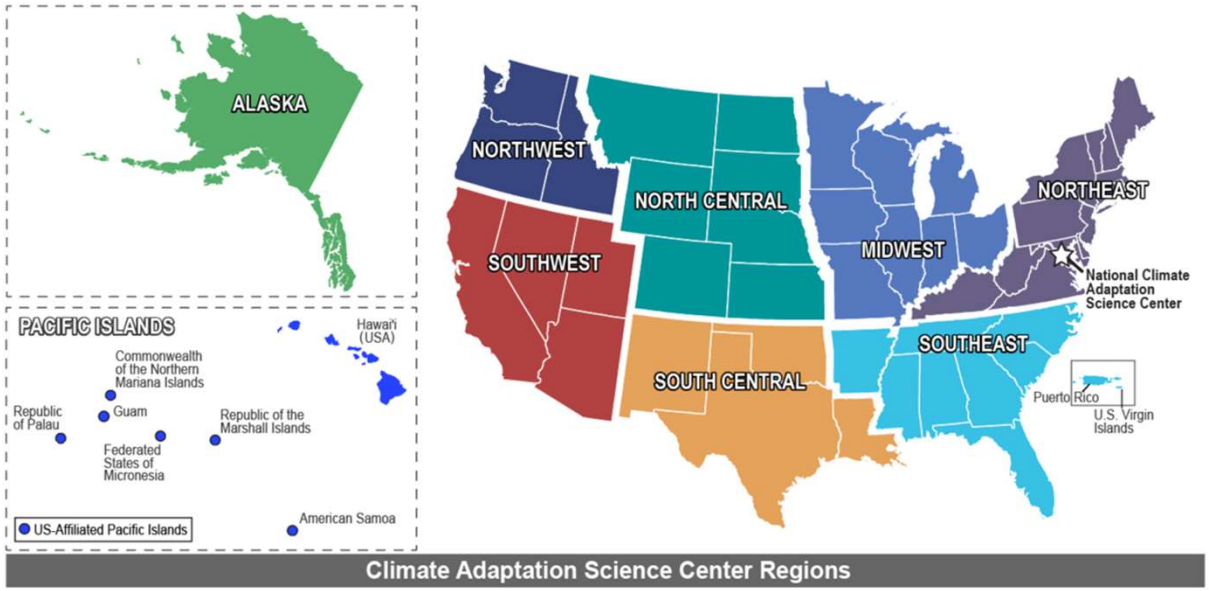
Climate Adaptation Planner and Research Scientist

Regional Transportation Planning Organization Roundtable
North Central New Mexico Economic Development District
February 18, 2022

SOUTH CENTRAL
CLIMATE ADAPTATION SCIENCE CENTER

CLIMATE ADAPTATION SCIENCE CENTERS



Climate Adaptation Science Center Regions

Department of the Interior
U.S. Geological Survey

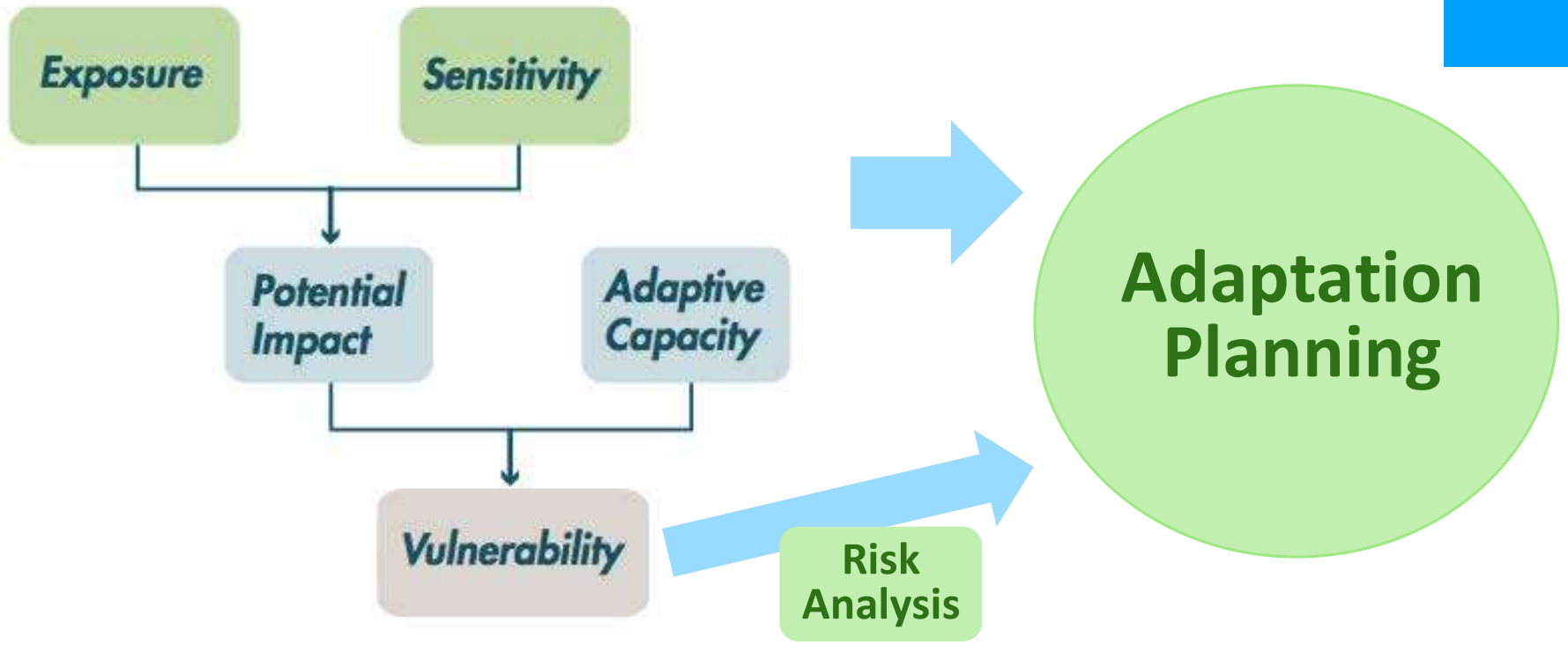
Partnerships with host universities
Regional consortia

South Central CASC
Hosted by University of Oklahoma
(UNM is a consortium member)

CASCs have tribal liaisons

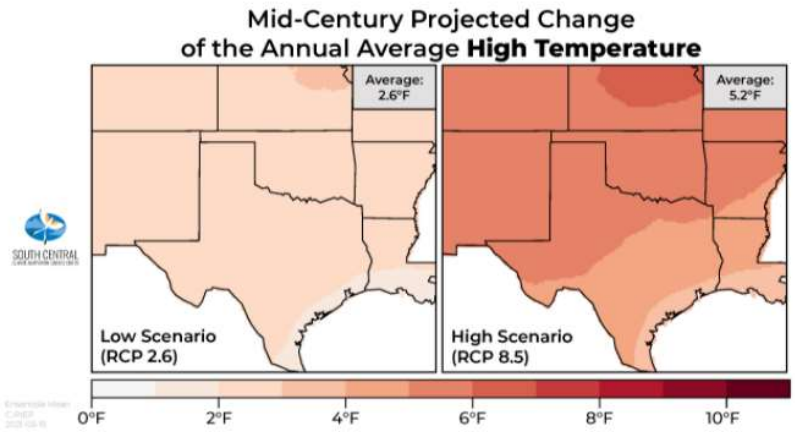
"The USGS National and Regional Climate Adaptation Science Centers (CASCs) is a partnership-driven program that teams scientists with natural and cultural resource managers and local communities to help fish, wildlife, water, land, and people adapt to a changing climate."
https://www.usgs.gov/programs/climate-adaptation-science-centers

VULNERABILITY ASSESSMENT MODEL



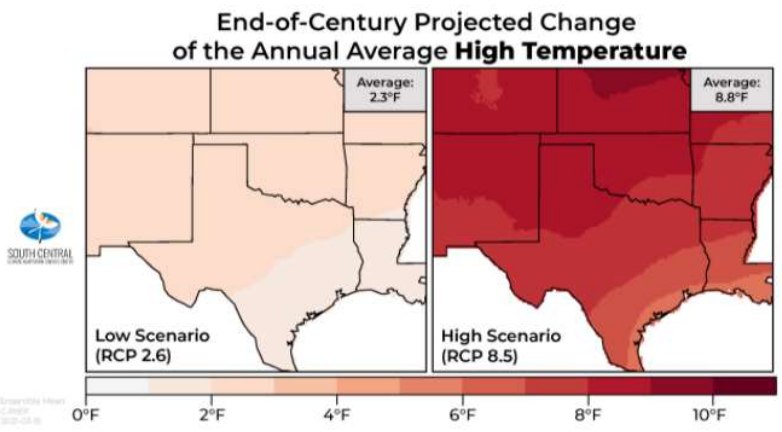
EXPOSURE: TEMPERATURE

MID-CENTURY (2036-2065)



NM: Approximately 5 degrees warmer, on average (high scenario)

END-OF-CENTURY (2070-2099)



NM: Approximately 7-8 degrees warmer, on average (high scenario)

Dixon K.W., A.M. Wootten, M.J. Nath, J. Lanzante, D.J. Adams-Smith, C.E. Whitlock, C.F. Gaitán, R.A. McPherson, 2020: South Central Climate Projections Evaluation Project (C-PrEP), South Central Climate Adaptation Science Center, Norman, Oklahoma, USA. DOI: https://doi.org/10.21429/12gk-dh47

Accessed 2/14/2022

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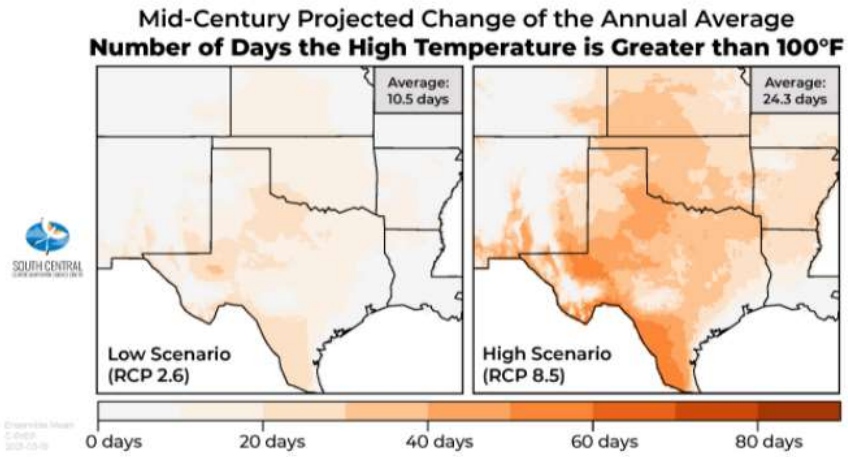
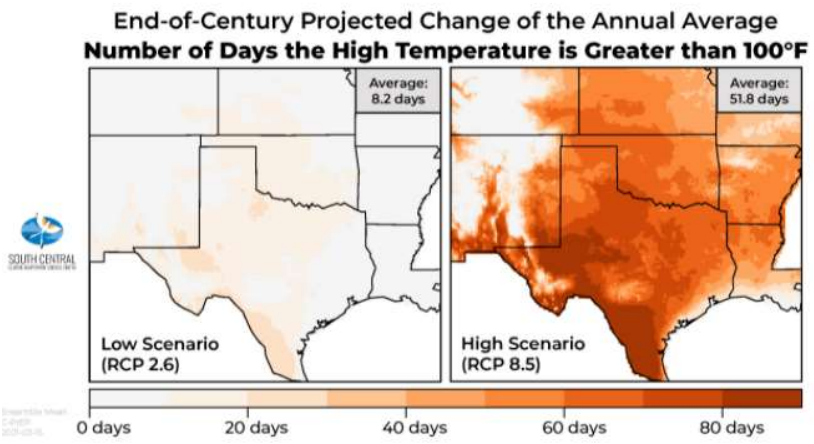


NM: From 0-50 more days with temperatures over 100 F (high scenario)

END-OF-CENTURY (2070-2099)



NM: From 0-80 more days with temperatures over 100 F (high scenario)

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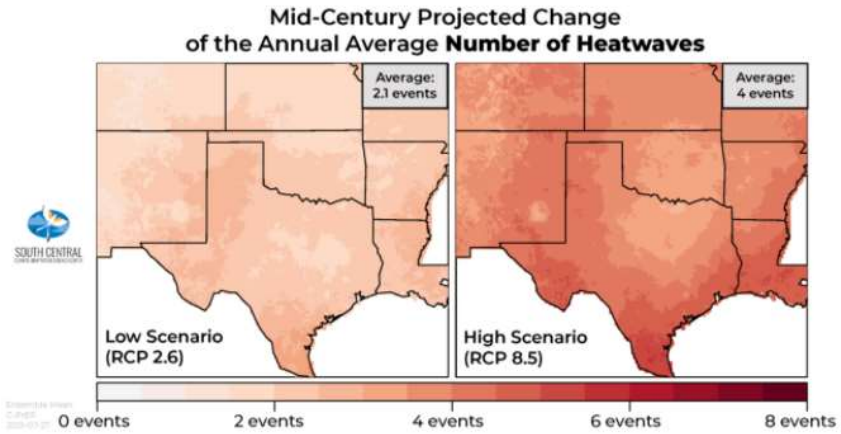

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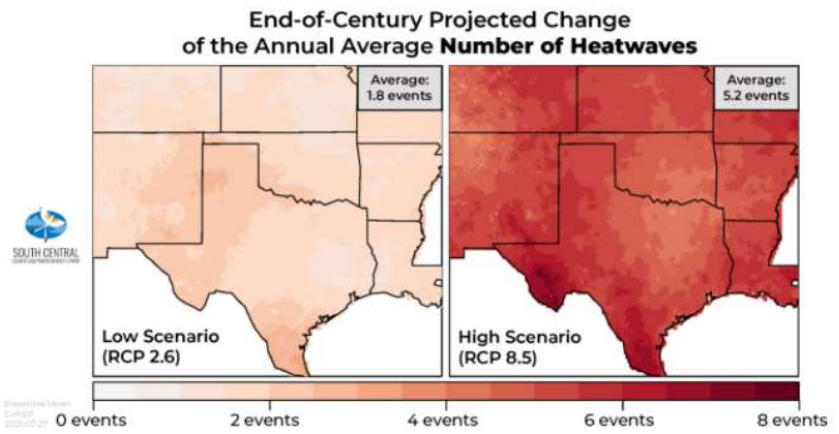

Heat wave = 3 or more consecutive days where the high temperature and the low temperature are both above the respective 95th percentiles from the historical period, in each grid cell

NM: 3-5 more heat waves/ year (high scenario)

NM: 3-7 more heat waves/ year (high scenario)

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EXPOSURE: PRECIPITATION

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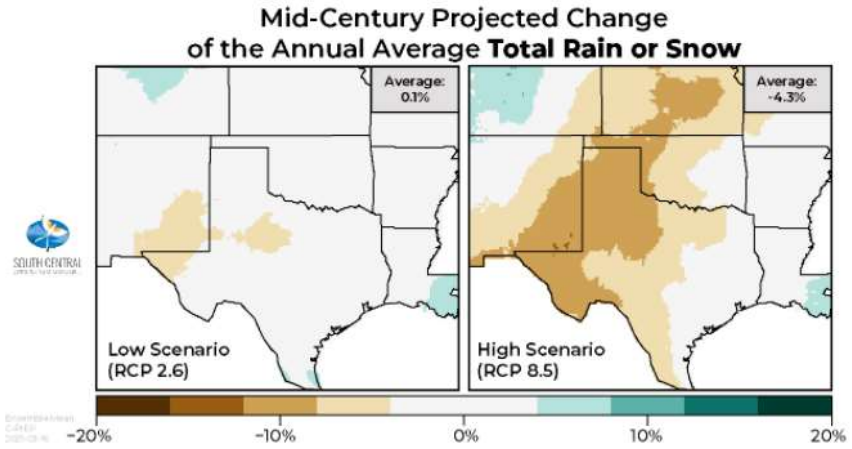

NM: Between 0 and 10% *decrease* in annual average precipitation (high scenario)

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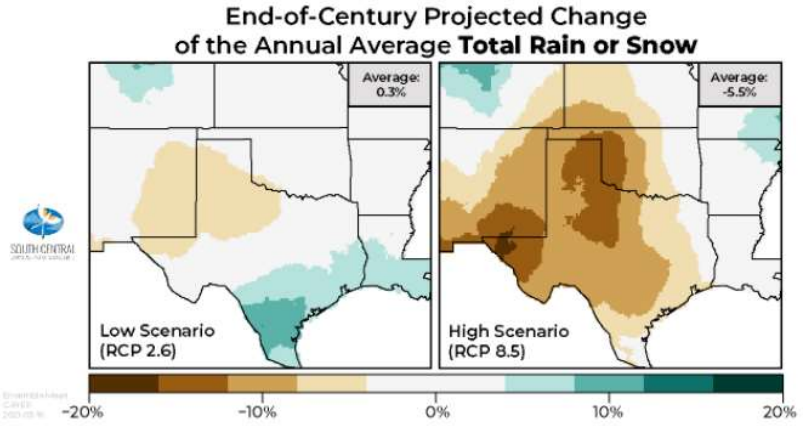

NM: Between 0 and 20% *decrease* in annual average precipitation (high scenario)

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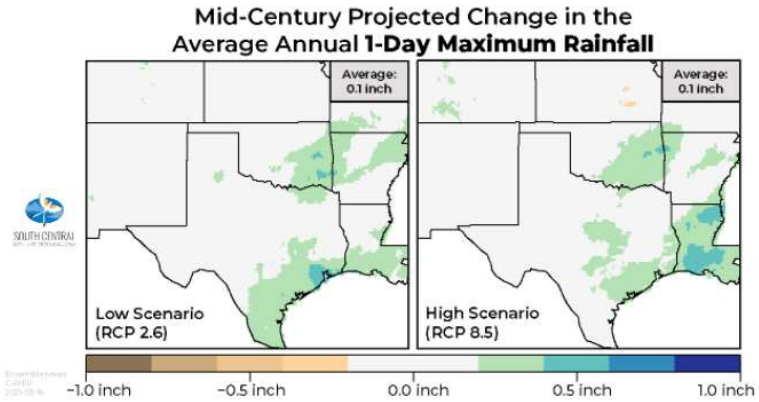

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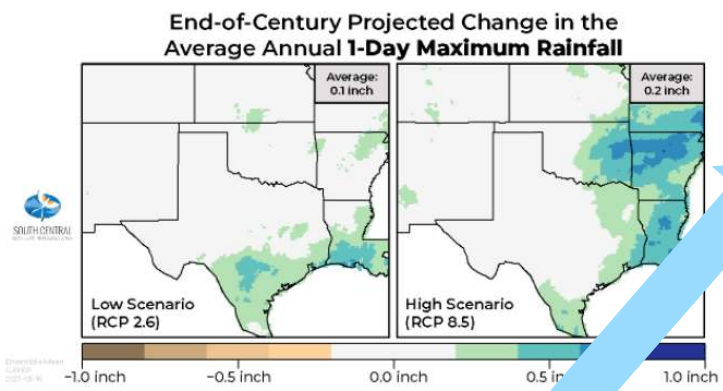

NM: Not much change in 1-day maximum rainfall amounts

Dixon K.W., A.M. Wootten, M.J. Nath, J. Lanzante, D.J. Adams-Smith, C.E. Whitlock, C.F. Gaitán, R.A. McPherson, 2020: South Central Climate Projections Evaluation Project (C-PrEP), South Central Climate Adaptation Science Center, Norman, Oklahoma, USA. DOI: https://doi.org/10.21429/12gk-dh47

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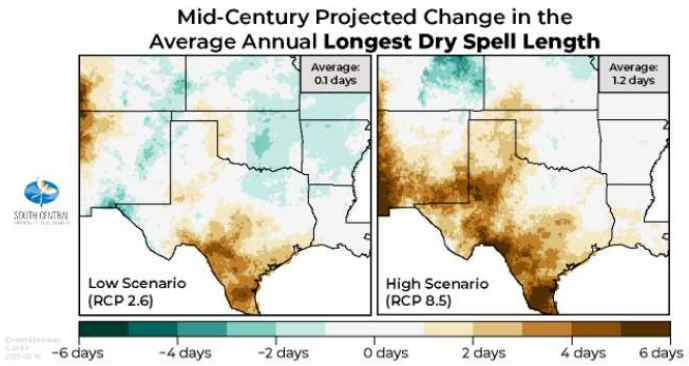
But --

- We know that a warmer atmosphere holds more moisture
- There may be local variations, and models vary in their predictions
- Example, Pueblo of Laguna
  - Days with precipitation >0.5 inches, no change to 2100
  - Days with precipitation >1 inch, increase from 4 days/year to 5-6 days per year – and perhaps up to 10 days/year – depending on the individual climate model

EXPOSURE: PRECIPITATION & DROUGHT

MID-CENTURY (2036-2065)



NM: Dry spells will be between 0 and 6 days longer (high scenario)

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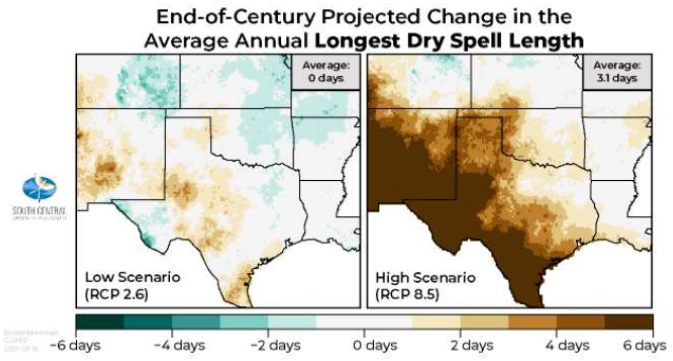

NM: Dry spells will be between 0 and 6 days longer – and throughout more of the state (high scenario)

Drought is likely to increase. Even if precipitation levels are steady, higher temperatures will cause more evaporation, leaving less water for rivers, soil, plants, and other uses.

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EXPOSURE: ADDITIONAL FACTORS

- Wildfire
  - Drought + insects + histories of fire suppression
  - Increased frequency and intensity
  - Importance of site-specific conditions
- Post-fire Flooding and Debris Flows
- Hail, High Winds, Tornados
  - Still too hard to predict long-term

SENSITIVITY – INFRASTRUCTURE

TEMPERATURE

Pavement and bridge decking

- Softening, expansion
- Possible fewer freeze-thaw cycles - but we can't predict this in the short term

Bridges

- Expansion joints – generally designed for a wide range of temperatures
- Bearings – typically designed up to 120 degrees (if built after 1987 – risk of bridge failure is a greater issue if built earlier)
- Materials – affect overall durability

Rail

- Track expansion, warping, buckling – but generally designed for anticipated range

+ Maintenance work can be affected by temperature

SENSITIVITY - INFRASTRUCTURE

PRECIPITATION

Water overtopping roadways/ trails/ railways

Debris flows, sand and silt deposition

Erosion/Scour – Flooding and Drought

- Roadways/ trails – pavement support. Also affected by shoulder absence/presence and width
- Bridge ramps, piers, substructures/ foundation, esp. if waterways change course
- Rail tracks and bridges

Highly dependent on drainage infrastructure

- Culvert size
- Maintenance

+ Maintenance work can also be affected by extreme precipitation

SENSITIVITY - MOBILITY

- Severe weather roadway closures
  - Possible decreased risk from snow, ice – but hard to predict in the short-term
  - Possible increased risk from heavy rain/flooding, debris flows, hail, high winds, dust storms, wildfire
- Heat particularly affects pedestrians, bicyclists, transit users

ADAPTIVE CAPACITY

"The ability of communities, institutions, or people to adjust to potential hazards, to take advantage of opportunities, or to respond to consequences" (USGCRP, 2016).

Factors:

- Available information on engineering design, e.g., plan sets – may be incomplete, unavailable
- Maintenance – jurisdiction, collaboration, capacity

ADAPTIVE CAPACITY

Other factors affecting New Mexico transportation that should be considered in planning:

- Aging infrastructure / design life of road
- Transit options
- Truck/freight impacts
- Pedestrian-involved crash rates
- Urban and rural needs
- Cultural resource protection
- Hazardous materials transport
- Technology gap
- Long-term revenue sources
- Multiple jurisdictions

RISK ANALYSIS

Vulnerability = Impacts + Adaptive Capacity

Risk = Likelihood + Consequences

For transportation –

Connectivity = Community Access + Network Redundancy

Community Access – destinations and population served (traffic count)

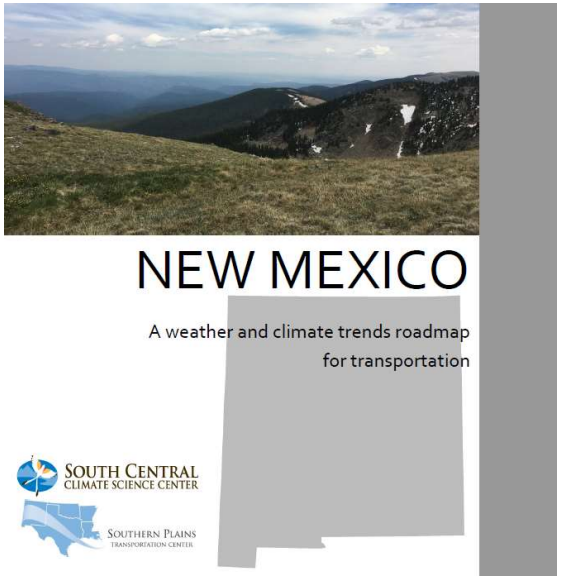
POSSIBLE STRATEGIES

- Resurfacing with materials for higher temperatures
- Maintenance of drainage facilities
- Engineering studies for areas of drainage concern
- Drainage design, increased recordkeeping
- Revise design standards for larger storm events, drainage structures
- Interjurisdictional coordination
- Enhance long-term revenue sources

Strategies and actions need prioritization

POTENTIAL SOUTH CENTRAL CASC SUPPORT

- Scoping for Climate Adaptation Planning
  - Tribal and Historically-Marginalized Communities
- Existing Climate Projections and Downscaling
  - https://southcentralclimate.org/resources/climate-projections/
  - NM and smaller areas
  - Mapping may be available
- Special Projects



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December 2017

https://southcentralclimate.org/

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THANK YOU!